Forest Harvesting Systems for Biomass Production

RE Consulting

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&
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Forest Harvesting Systems for Biomass Production

1. In-Woods Conversion
   a. Harvesting
   b. Accumulation
   c. Processing
   d. Transport
2. Applicability to Massachusetts
3. The Contractor's Perspective
4. Next Steps

Appendices

- Biomass Conversion Systems
  - 101 equipment combinations
- 5 case studies
  - Biomass suppliers
  - 1 large biomass purchaser

Harvesting Residue Utilization

- Four general steps:

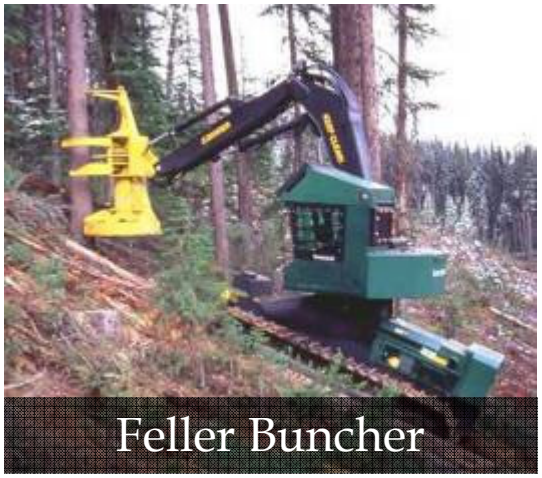
101 biomass conversion systems

Biomass Conversion System

1. Harvesting
   - Processes required to deliver a delimbed and topped product to roadside
2. Accumulation (not required for all harvesting systems)
   - Collecting and piling harvesting residue
3. Processing
   - Converting harvesting residue into smaller pieces (hog fuel or chips)
4. Transport

Common Biomass Conversion Systems

Harvesting Step: Mechanical System



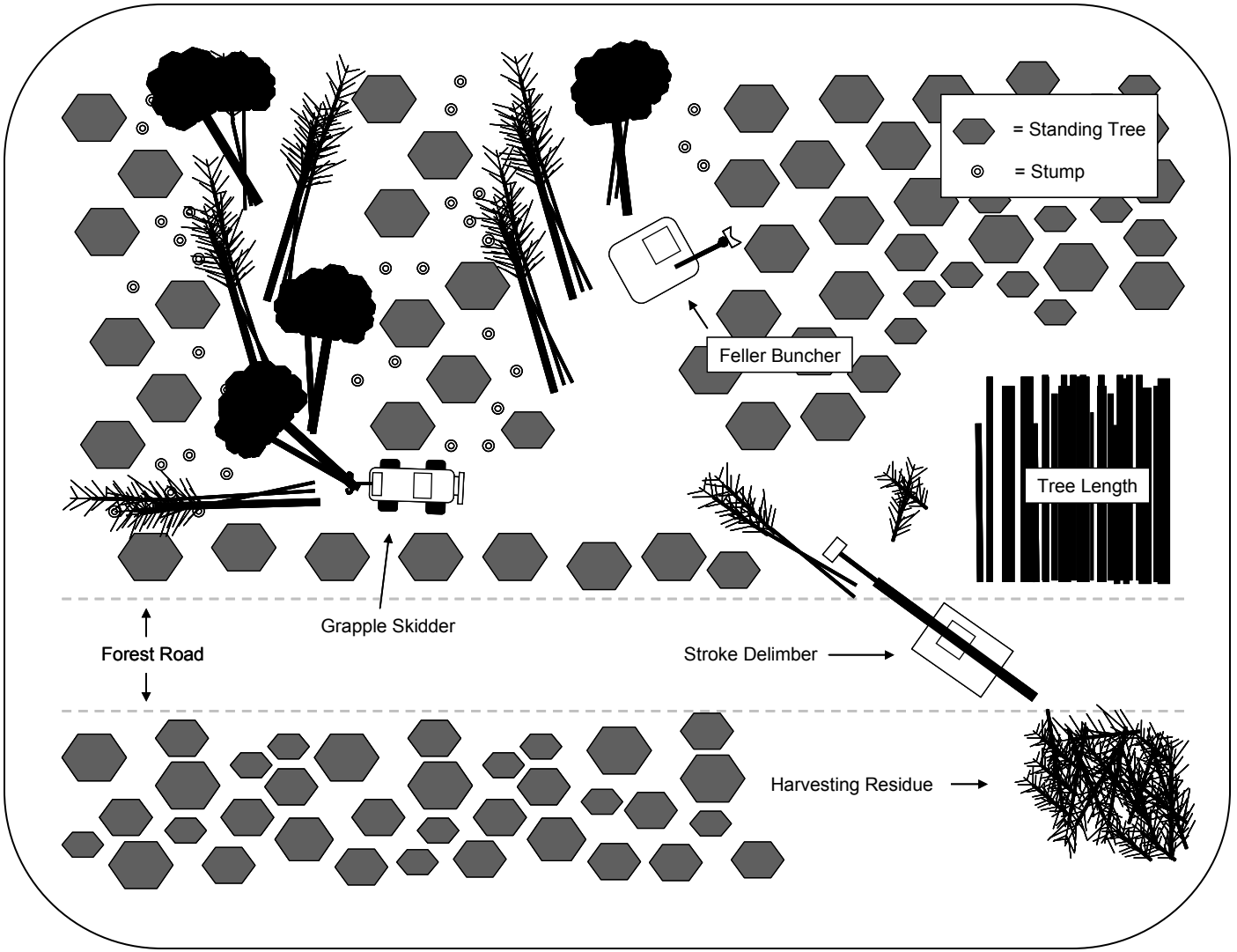
Feller Buncher

Grapple Skidder

Delimber

Common Biomass Conversion Systems

Harvesting Step: Mechanical System



Common Biomass Conversion Systems

Alternative Processing Step: Horizontal Grinder and Excavator

Horizontal Grinder

Excavator

Establishment of Biomass Processing Operations

Framework for contractors to consider:

- Business plan
  - Demand (e.g., purchasing facilities)
  - Resource Supply (e.g., wood volume)
  - Competitors (e.g., other biomass processing companies)
  - Cost and Revenue projections
  - Financing (e.g., sources of funds)

- Production Balancing
  - For example:
    - Annual logging roundwood production = 100,000 tons
    - Estimated Harvesting Residue production = 15,000 tons
    - Minimum Economic Chipper production = 35,000 tons
    - Gap Harvesting Residue volume = 20,000 tons

Establishment of Biomass Processing Operations

Framework for contractors to consider:

- Fit with Existing Operations
  - Compatible processing and transport options with existing harvesting equipment
    - Implications on trucking costs (e.g., backhaul options)
  - Complimentary to existing business operations and infrastructure

- New or Used Equipment
  - Trade offs between ownership expenses (e.g., loan payments, insurance, etc.), machine utilization, and maintenance and repair costs.
  - Cost volatility higher for used equipment

- Risk Management
  - Leasing equipment
  - Contract terms (e.g., long-term supply, repurchase, take-or-pay)
  - Purchasing equipment with alternative uses